STEM

Developing Viable Carriers for Bioactive Molecules Using Biopolymers

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In life sciences, many technological problems have known solutions, but what prevents them from being practical is the lack of successful means of administration. Treatments for malnutrition and cancer are notable examples. The commonality between possible solutions for these two conditions is the need for a carrier that is capable of maintaining stable architecture while releasing what it encapsulates in a sustainable manner. In a 2013 article, “Organized Polysaccharide Fibers as Stable Drug Carriers,” Janaswamy, Gill, Campanella, and Pinal demonstrated the feasibility of biopolymers in constructing such suitable delivery systems.

It is highly desirable to find a widely utilized and economical polysaccharide system. Xanthan gum is used extensively in food and non-food applications and certainly stands out as a possible candidate. It is a negatively charged bacterial polysaccharide and the network arrangement could be achieved by preparing oriented fibers from 1.0–2.0% solutions in the presence of cations. It is the goal of this research to examine the type and amount of salt that renders stable packing for xanthan.

The xanthan solutions were prepared with ethylenediamine dihydrochloride, tetramethylammonium chloride, sodium chloride, potassium chloride, and rubidium chloride. They were all viscous and behaved very differently from iota-carrageenan, the “template” gelling polysaccharide that forms oriented and crystalline

fibers. The results suggest that ethylenediamine and sodium ions could impart interactions among the xanthan chains in yielding sturdy fibers. X-ray diffraction protocols will be used to establish the molecular and packing structure.

Research advisor Srinivas Janaswamy writes, “Polysaccharides have been part of the human diet for many centuries. Developing carriers of health-promoting and disease-preventing compounds based on polysaccharides possessing stable structures is an elegant and novel approach, and Zijian’s project scouts for a suitable biopolymer.”

Fiber holders (left) and fiber puller (right). Polysaccharide samples are loaded onto the glass rods of a fiber holder and stretched in a puller.

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